

WHAT IS CLAIMED IS:

1. A receiving process method of a receiving apparatus used in a mobile communication system in which a sending apparatus sends a plurality of code channels as code channel groups to which spreading codes are assigned to a receiving apparatus, and said receiving apparatus receives said code channels, said receiving process method comprising the steps of:
 - when spreading codes used for said code channel groups are orthogonal code sequences, generating received spreading signal sequences of said code channel groups according to the number of received paths; and
 - removing received spreading signal sequences of a received path of own code channel group of said receiving apparatus which should be removed from received signals.
2. The receiving process method as claimed in claim 1, comprising the steps of:
 - when spreading codes of other code channels used for control or used for other channels in said code channel group are orthogonal code sequences,
 - generating received spreading signal sequences of said code channel groups according to the number of received paths; and
 - removing received spreading signal sequences of received paths of other code channels which should be removed from received signals.

3. The receiving process method as claimed in claim 1, comprising the steps of:

5 when all or a part of said spreading codes used for said code channel groups are non-orthogonal code sequences,

 generating received spreading signal sequences of said code channel groups according to
10 the number of received paths; and

 removing received spreading signal sequences of other code channels which are non-orthogonal in the same received path from received signals.

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20 4. The receiving process method as claimed in claim 1, comprising the steps of:

 when said receiving apparatus receives a code channel group from another sending apparatus which is not connected to said receiving apparatus,
25 generating received spreading signal sequences of said code channel group from another sending apparatus according to the number of received paths; and

 removing received spreading signal sequences of said code channel group from received signals.

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5. The receiving process method as claimed in claim 1, wherein said receiving spreading code

sequence is generated on the basis of an estimated value of channel variations and an estimated value of data modulation obtained for each code channel.

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6. The receiving process method as claimed in claim 5, comprising the steps of:

10 said sending apparatus sending pilot signals of which said receiving apparatus knows sending phase and sending amplitude to said receiving apparatus periodically; and
 said receiving apparatus measuring
15 received phase and received amplitude of said pilot signals, and obtaining said estimated value of said channel variations by comparing said sending phase and sending amplitude with received phase and received amplitude.
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7. The receiving process method as claimed in claim 6, comprising the steps of:

25 said receiving apparatus obtaining said estimated value of channel variations by averaging said estimated value of channel variations obtained by using said pilot signals and an estimated value
30 of channel variations obtained by comparing decision results of data modulation with receiving phase and amplitude for data signals.

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8. The receiving process method as claimed

in claim 7, comprising the steps of:

obtains said estimated value of channel variations on the basis of said pilot signals, said data signals and said decision results of said data modulation;

updating data modulation decision results by using said estimated value of channel variations; and

updating said estimated value of channel variations on the basis of said updated data modulation decision results.

9. The receiving process method as claimed in claim 5, wherein the same estimated value is used as said estimated value of channel variations for code channels sent from the same sending apparatus.

10. The receiving process method as claimed in claim 5, comprising the steps of:
performing coherent detection by using said estimated value of channel variations for received despread signals of data signals obtained by despreading received signals from which said received spreading signal sequences have been subtracted;

wherein, when said receiving apparatus receives signals by path diversity or by antenna diversity, said receiving apparatus estimates data modulation by performing hard decision for signals on which antenna diversity has been performed.

11. The receiving process method as
5 claimed in claim 5, comprising the steps of:
when said sending apparatus performs data
modulation for sending original information data
sequences which have been error correction coded
beforehand,
10 said receiving apparatus performing
coherent detection by using said estimated value of
channel variations for received despread signal of
data signals obtained by despreading received
signals from which said received spreading signal
15 sequences have been subtracted, performing error
correction decoding on signals after performed
antenna diversity combining when signals were
received by path diversity or antenna diversity so
that original information data sequences are
20 estimated;
said receiving apparatus performing error
correction coding on said original information data
sequences which are estimated; and
said receiving apparatus performing data
25 modulation by using data sequences which are
obtained by performing error correction coding on
said original information data sequences so that
data modulation is estimated.

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12. The receiving process method as
claimed in claim 8, comprising the steps of:
35 updating said received spreading signal
sequences on the basis of updated estimated values
of channel variations; and

demodulating code channels to be demodulated by using signals obtained by subtracting said updated received spreading signal sequences from received signals.

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13. A receiving apparatus which receives
10 code channel groups each including code channels from sending apparatuses, said receiving apparatus including an interference canceler which comprises a plurality of stages,

15 a first stage of said stages comprising:
a data modulation estimation part and a channel estimation part for estimating data modulation and channel variations for each received code channel which is a subject for interference canceling;

20 a multiplier for multiplying an estimated data modulation signal by an estimated value of channel variations; and

a received spreading signal sequence generation part for obtaining a received spreading
25 signal sequence for each multipath by performing spreading a received signal by using a corresponding spreading code;

a stage after said first stage in said stages comprising:

30 an other channel multipath interference canceling part for subtracting received spreading code sequences of other code channels obtained in the previous stage from received signals for each received code channel which is a subject for
35 interference canceling;

an own channel multipath interference canceling part for subtracting received spreading

signal sequences of own code channels obtained in the previous stage corresponding to a path which is a subject for demodulation;

5 a part for preparing signals corresponding to the number of multipaths obtained by subtracting received spreading signal sequences from received signals by said other channel multipath interference canceling part and by said own channel multipath interference canceling part, and updating estimated values of data modulation and channel variations by
10 using said prepared signals;

a received spreading signal sequence updating part for updating received spreading signal sequences on the basis of updated estimated values
15 of data modulation and channel variations;

a last stage in said stages comprising a data demodulation part for demodulating data by using signals obtained by subtracting received spreading code sequences obtained in the previous
20 stage from received signals for code channels to be demodulated.

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14. The receiving apparatus as claimed in claim 13, said receiving apparatus comprising a first channel variation estimation part for sending pilot signals of which said receiving apparatus
30 knows sending phase and sending amplitude to said receiving apparatus periodically; and for measuring received phase and received amplitude of said pilot signals, and obtaining said estimated value of said channel variations by
35 comparing said sending phase and sending amplitude with received phase and received amplitude.

15. The receiving apparatus as claimed in
5 claim 14, said receiving apparatus comprising a
second channel variation estimation part for
performing estimation of channel variations by
averaging said estimated value of channel variations
10 obtained by said first channel variation estimation
part and an estimated value of channel variations
obtained by comparing decision results of data
modulation with receiving phase and amplitude for
data signals.

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16. The receiving apparatus as claimed in
claim 15, said receiving apparatus comprising:
20 a third channel variation estimation part
for performing estimation of channel variations on
the basis of said pilot signals, said data signals
and said decision results of said data modulation;
a data modulation decision updating part
25 for updating data modulation decision results by
using an estimated value of channel variations
obtained by said third channel variation estimation
part; and
a channel variation estimation updating
30 part for updating said estimated value of channel
variations on the basis of said updated data
modulation decision results.

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17. The receiving apparatus as claimed in

claim 15, wherein the same estimated value is used as said estimated value of channel variations for code channels sent from the same sending apparatus.

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18. The receiving apparatus as claimed in claim 13, comprising:

10 an coherent detection part for performing coherent detection by using said estimated value of channel variations for received despread signals of data signals obtained by despread receiving signals from which said received spreading signal sequences have been subtracted;

15 a first data modulation estimation part for estimating data modulation by performing hard decision for signals on which antenna diversity has been performed, when said receiving apparatus
20 receives signals by path diversity or by antenna diversity.

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19. The receiving apparatus as claimed in claim 13, comprising:

30 a coherent detection part for performing coherent detection by using said estimated value of channel variations for received despread signal of data signals obtained by despread receiving signals from which said received spreading signal sequences have been subtracted when said sending
35 apparatus performs data modulation for sending original information data sequences which have been error correction coded beforehand;

an original information data sequence
estimation part for performing error correction
decoding on signals after performed antenna
diversity combining when signals were received by
5 path diversity or antenna diversity so that original
information data sequences are estimated;

a second data modulation estimation part
for performing error correction coding on said
original information data sequences which were
10 estimated, and performing data modulation by using
data sequences which are obtained by performing
error correction coding on said original information
data sequences so that data modulation is estimated.

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20. The receiving apparatus as claimed in
claim 13, comprising:

20 a data modulation estimation adaptive
switching part for switching between a first data
modulation estimation part and a second data
modulation estimation part for performing estimation
of data modulation in each stage of said
25 interference canceler;

said first data modulation estimation part
estimating data modulation by performing hard
decision for signals on which antenna diversity has
been performed, when said receiving apparatus
30 receives signals by path diversity or by antenna
diversity;

said second data modulation estimation
part performing error correction coding on said
original information data sequences which were
35 estimated, and performing data modulation by using
data sequences which are obtained by performing
error correction coding on said original information

data sequences so that data modulation is estimated.

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21. The receiving apparatus as claimed in
claim 13, comprising a subtracting part for
subtracting received spreading signal sequences from
received signals after multiplying said received
10 spreading signal sequences by predetermined
interference removing weight coefficients.

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